



**U.S. Department of Energy**  
**Energy Efficiency**  
**and Renewable Energy**

Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable

**Federal Energy Management Program**

# Federal Energy and Water Requirements

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## NASA and the Department of Energy

Scott Richlen  
September 2008



1. Federal Responsibilities for Energy and Water Reductions (under EPCA, E.O. 13423 and EISA)
2. Federal Energy Consumption
3. Energy Management Status at NASA
4. FEMP Support
5. DOE Approach to Meeting Federal Requirements
6. Success Strategy - The DOE TEAM Initiative



- EPact 2005 set new baselines for Federal agencies in energy and water conservation, renewable energy use
- Executive Order 13423 set even higher goals for Federal agencies to achieve
  - Improve energy efficiency and reduce greenhouse gases by 3% annually or 30% by 2015 (2003 baseline)
  - Reduce water usage by 2% per year through 2015 (2007 baseline)
  - Reduce fleet petroleum consumption by 2% annually, and increase non-petroleum fuels by 10% annually through 2015 (2005 baseline).
  - Ensure at least 15 percent of building inventory incorporates requirements described in the Guiding Principals & Sustainable Buildings MOU.
  - Requires sustainable practices in acquisitions

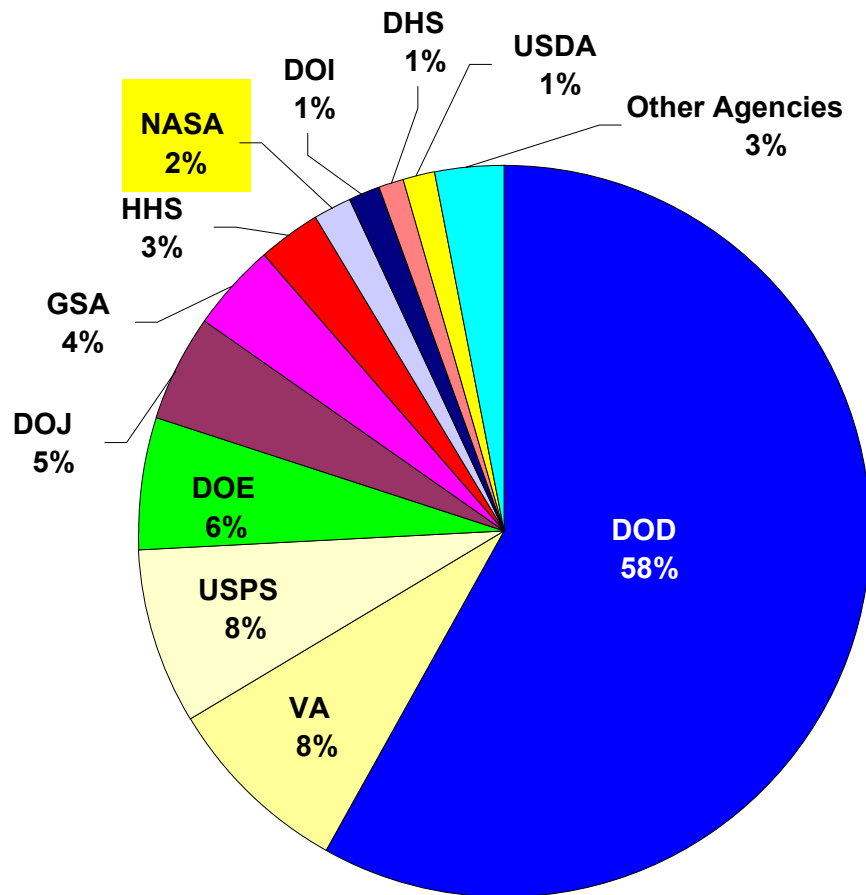


## Energy Independence and Security Act, 2007

- Codifies E.O. and EPA's efficiency, water, renewable energy and sustainability goals
- Assigns Energy Managers
- Comprehensive Audit Requirements
  - Identify "covered facilities" (75% of energy use)
  - Comprehensive energy & water evaluations (25% annually)
  - Bundle and implement ECMs using financing, appropriations, or combinations of both
- Congressional/Administrative attention

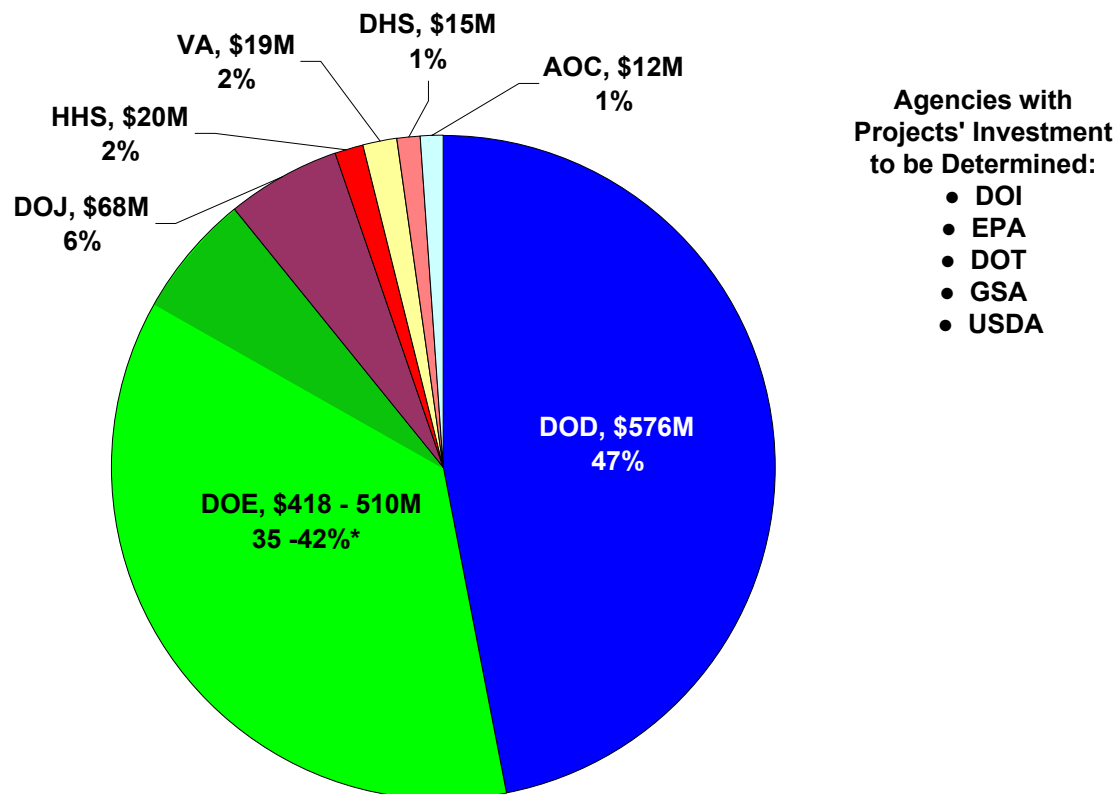


## FY 2007 Annual Consumption in Facilities Subject to the EO/EISA Goal: 353.5 Trillion Btu





## Percentage Use of Super ESPC Mechanism by Agency Project Pipeline: \$1.2 Billion in Potential Investment



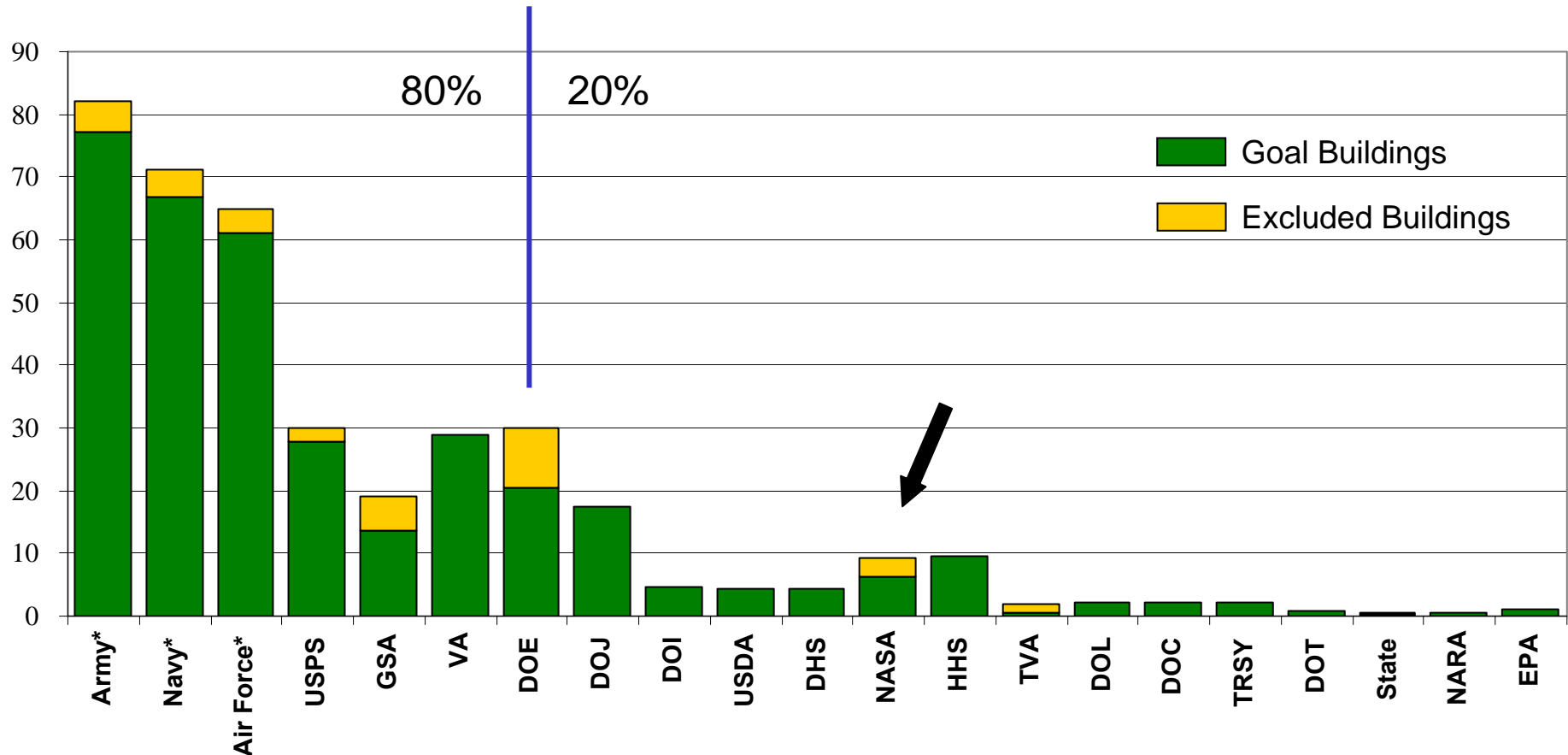
\* Range based on estimates of early-stage proposals as of March 2008



# Federal Buildings Energy Use (trillion Btu/yr) by Agency

trillion Btu/yr

data FY2007



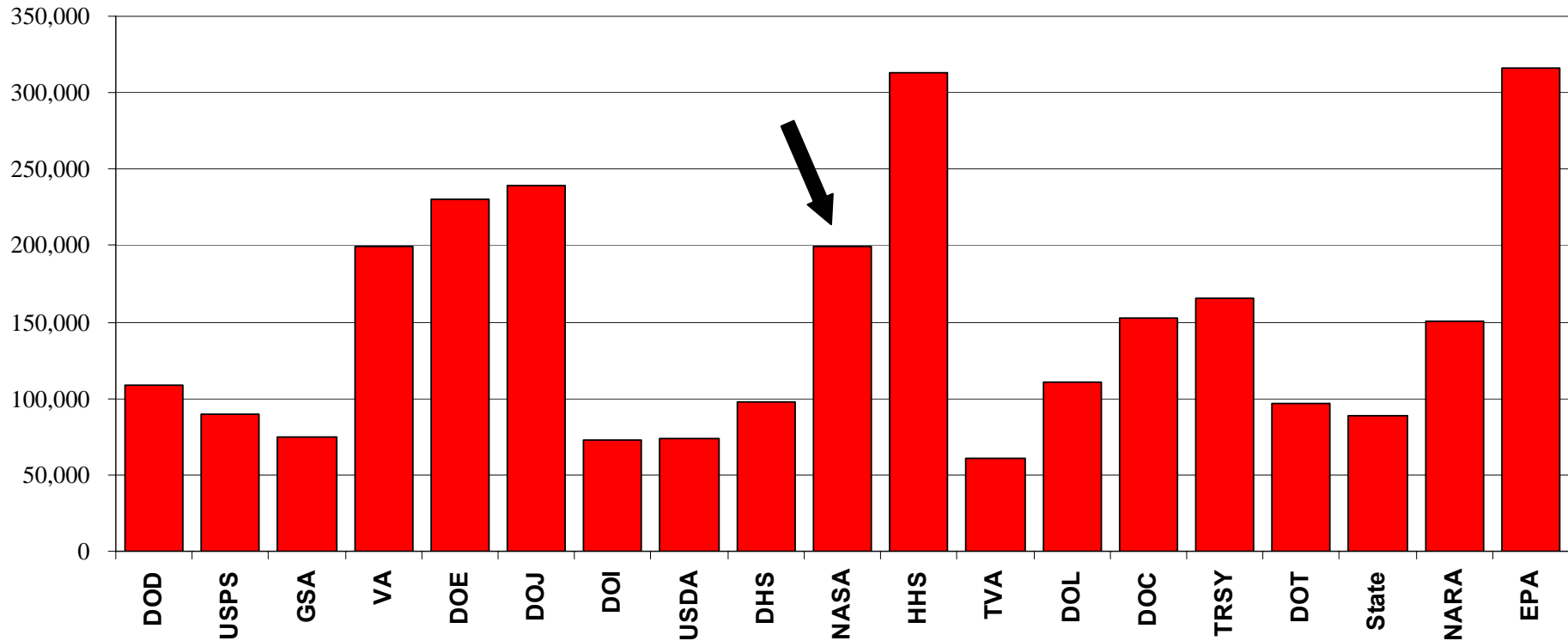
**NASA is in the lower 20% of Federal Agencies in terms of Energy Use.**



# Federal Buildings Energy Intensity (Btu/ft<sup>2</sup>) by Agency

**Btu per Gross Square Foot**

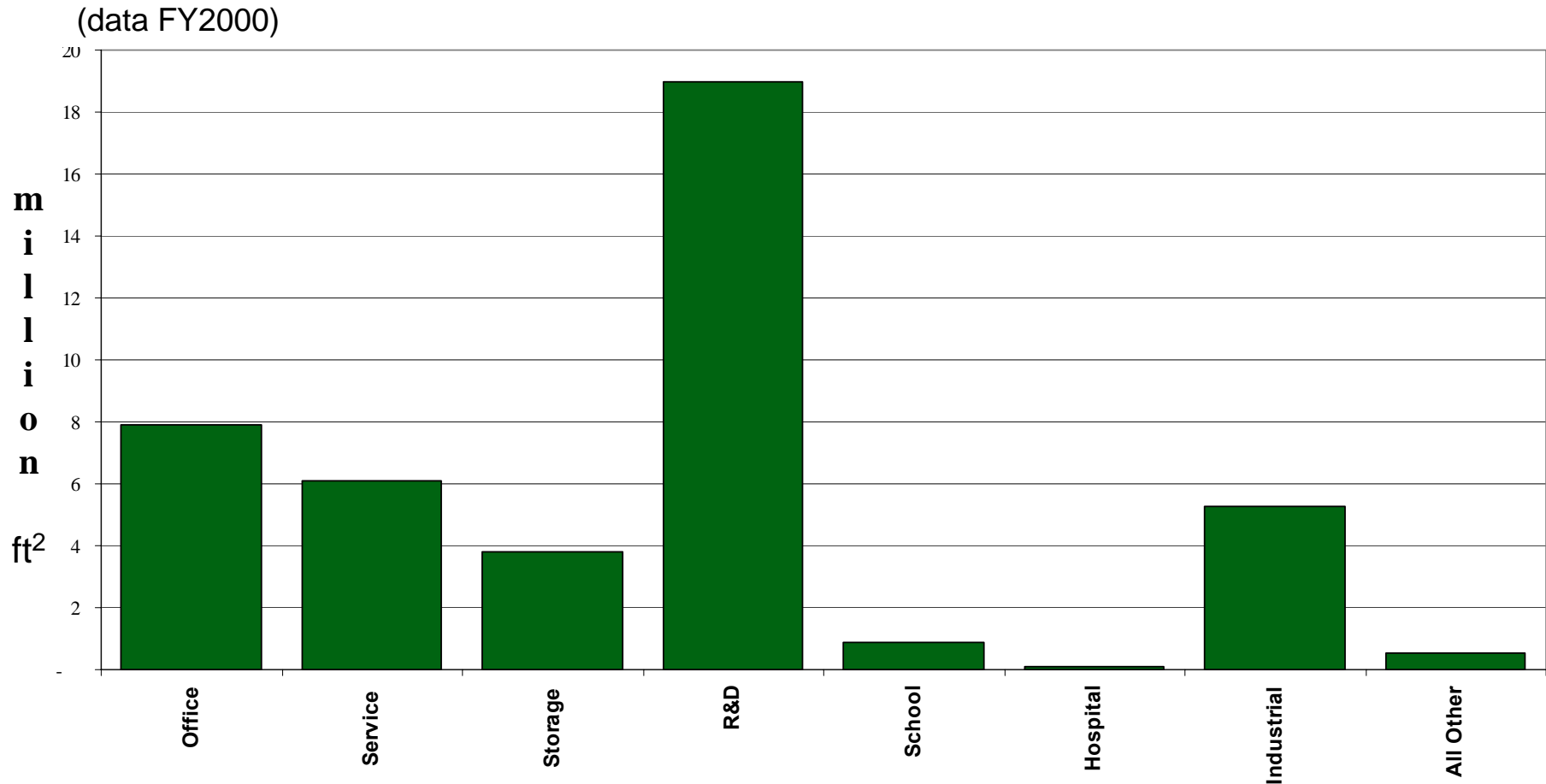
data FY2007



**NASA is one of the more energy intensive agencies.**



# NASA Building Type (million ft<sup>2</sup>)



**R&D square footage predominates.**  
**44% of square footage is associated with R&D.**  
**R&D is also one of the most energy intensive building types.**



# Major Activities - Toolkit

- *Technical Assistance*
- *Training*
- *Core information resources*
  - Design Guide
  - Case Studies
  - Energy Benchmarking
  - Best Practice Guides
- *Design process tools*
  - Env. Performance Criteria
  - Design Intent Tool
  - Labs21 Process Manual

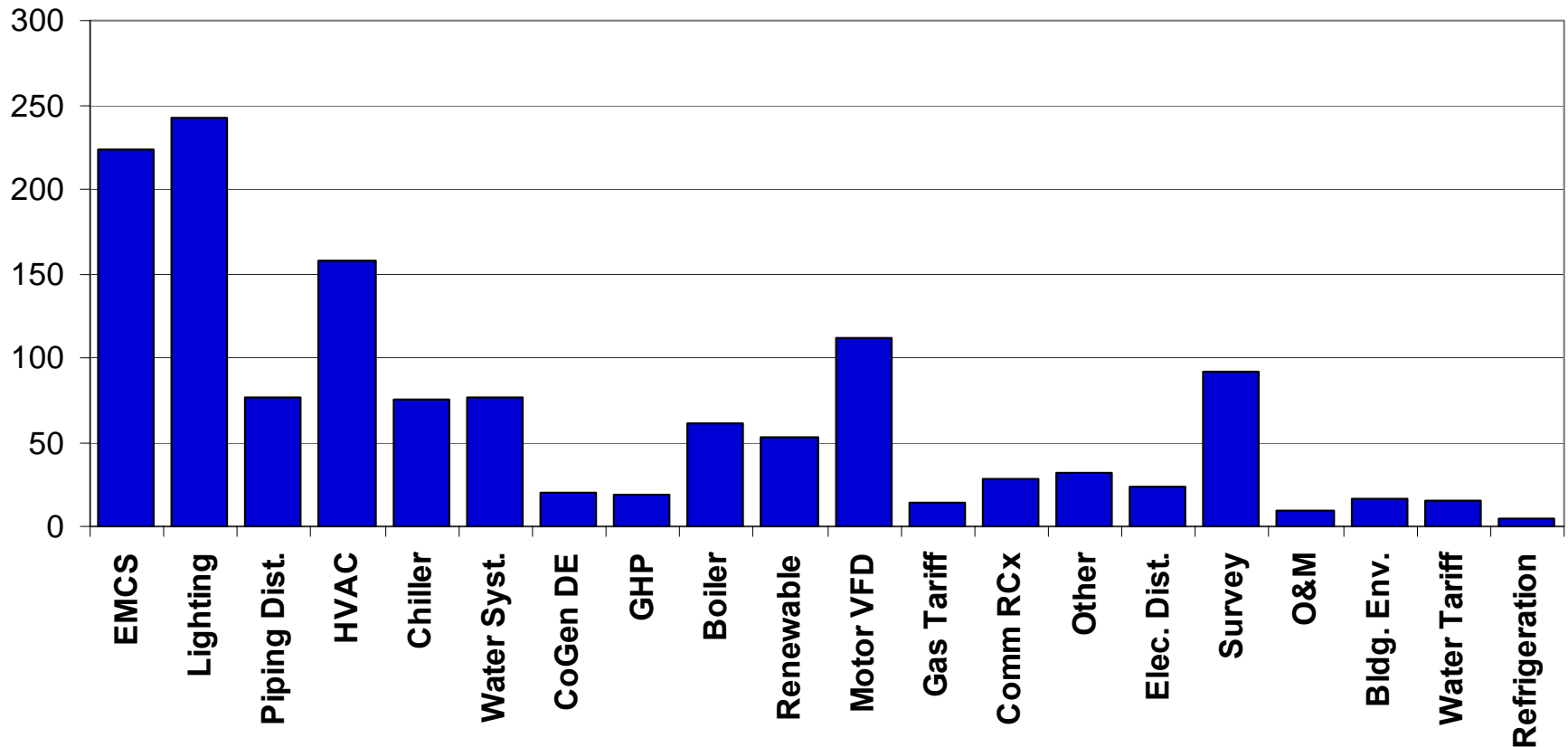


<http://www.labs21century.gov/>



# Number of ESPC Activities By Technology Category

**Number of Technology Category Activities (all Agencies)**

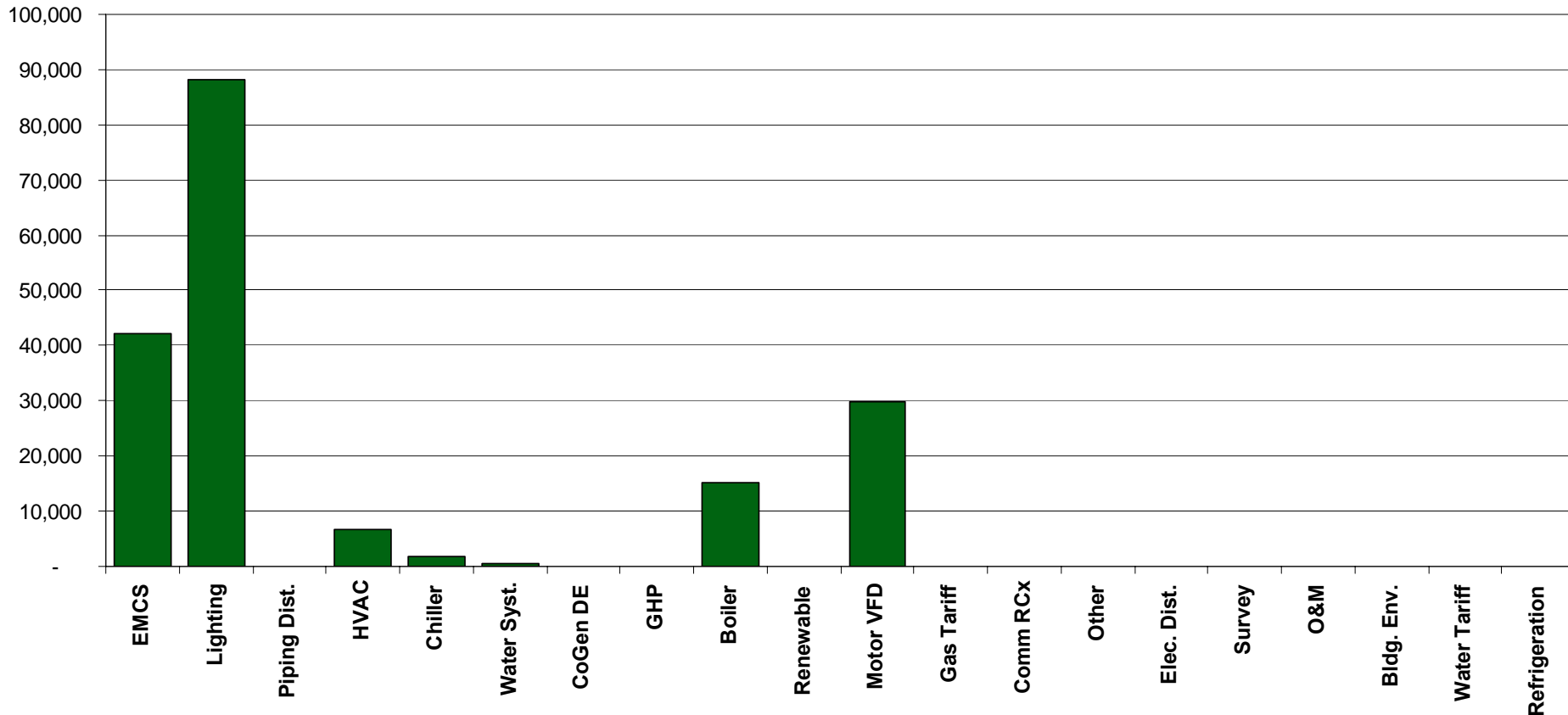


To date most activity has been in Lighting, EMCS, HVAC, and Motors/VFD.



## 4 ESPCs at NASA MBtu/yr Saved By Technology Category

NASA - million Btu/yr Saved by Technology Category

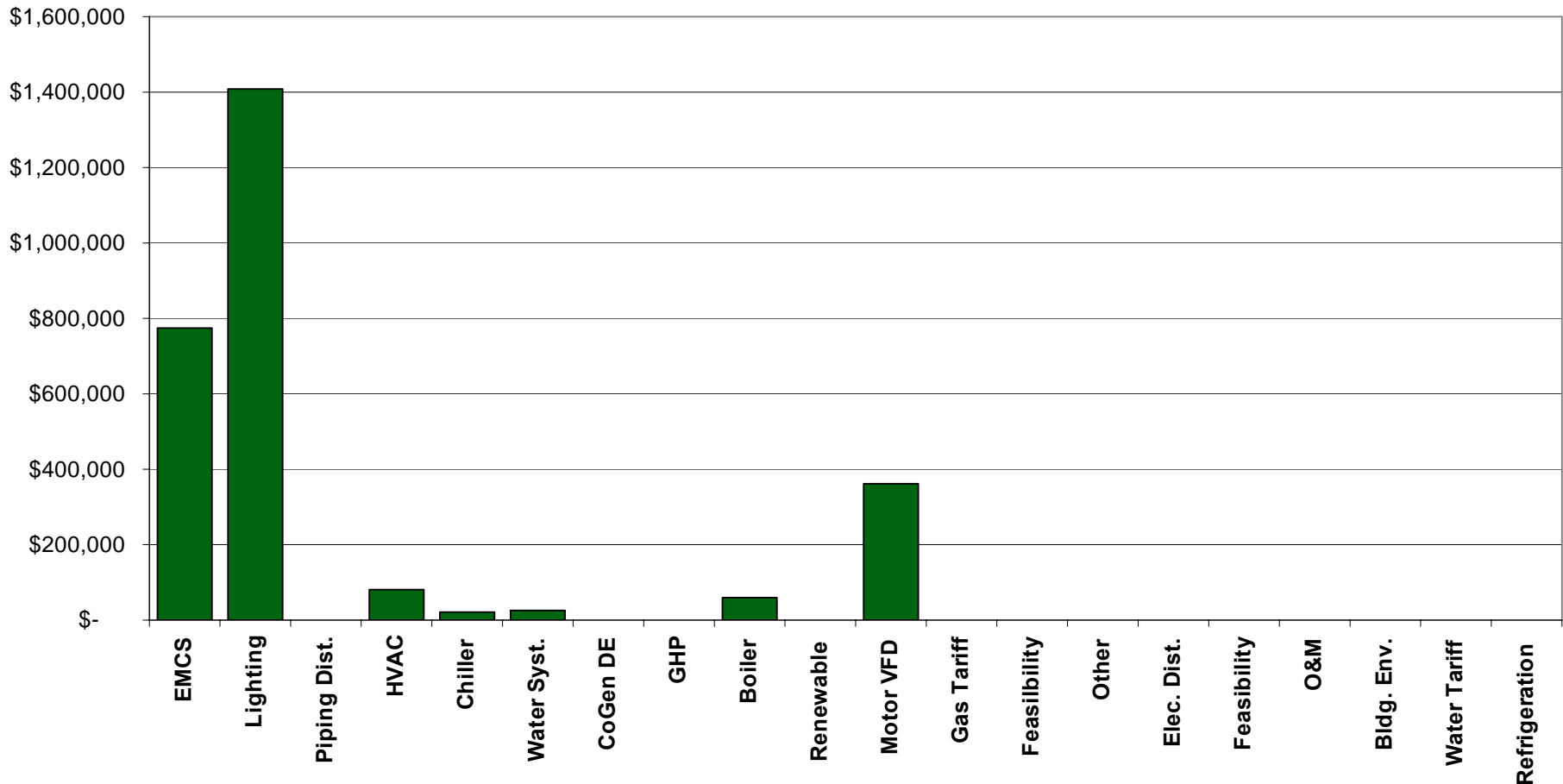


**NASA has Annual Savings of About 184 billion Btu.**



## 4 ESPCs at NASA - \$/yr Saved By Technology Category

NASA - Dollars/yr Saved by Technology Catagory

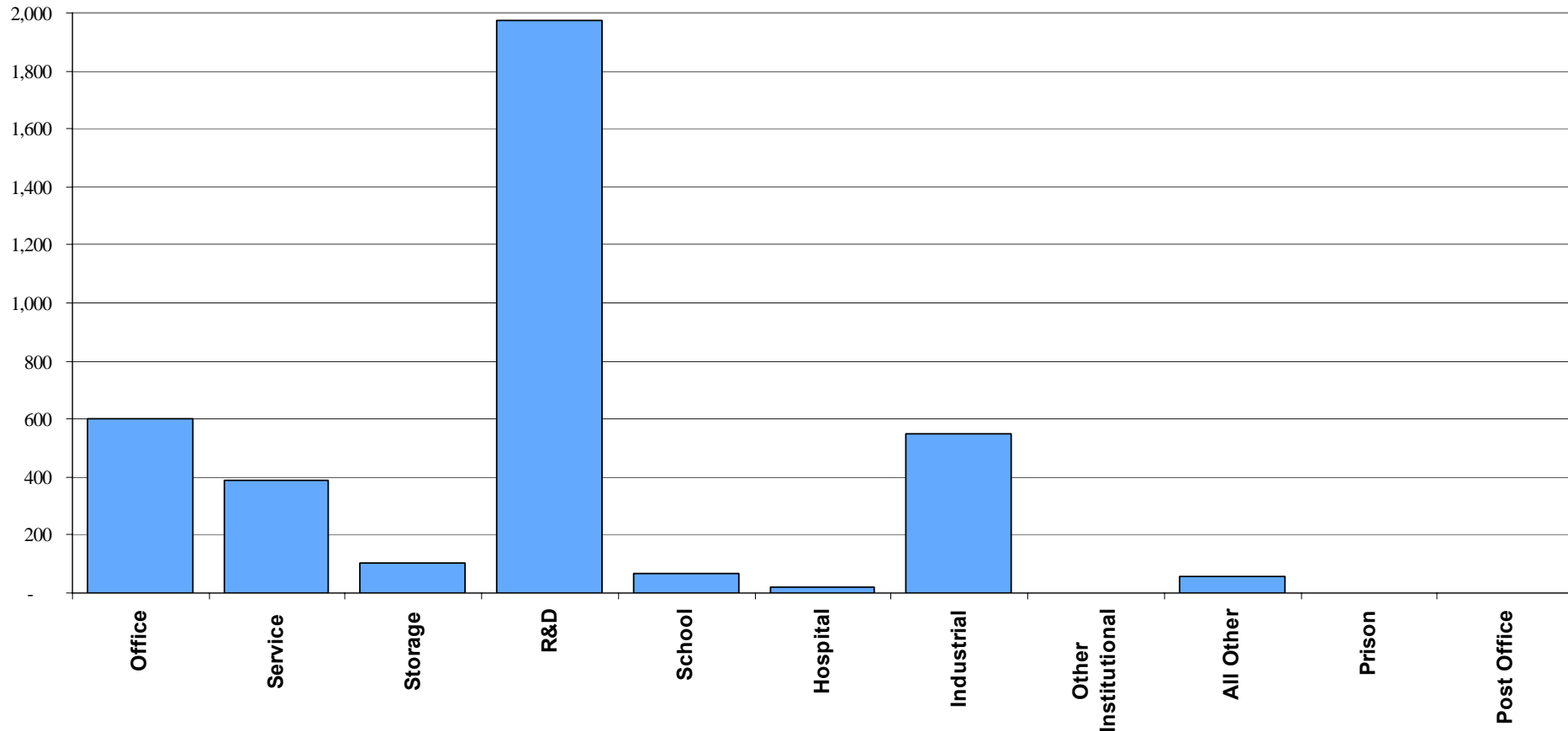


**NASA has Annual Savings of About \$2.75M.**



## Energy Consumption by Building Type at NASA

MBtu/yr



**R&D Building Energy Use predominates**

**53% of building energy use and 44% of area is associated with R&D**



## FEMP helps other agencies by:

- ***Sharing*** successful best practices
- ***Training*** personnel on energy savings performance contracting
- ***Providing*** technical assistance
- ***Assisting*** with Federal Finance Specialists & Project Facilitators
- ***Tracking*** project milestones, investment, performance data
- ***Providing*** management and policy support as needed



## Project Financing

Alternative Financing Mechanisms have become a key success factor for agency savings

- Energy savings performance contracts (ESPC)
- Utility energy savings contracts (UESC)
- Power purchase agreements (PPA)

The traditional appropriations process, in comparison, does not guarantee the funding amount requested and opportunities are often lost because the process is long and arduous

Private party financing allows agencies to avoid the circuitous appropriations process which can take over 2 years.



## **DOE's approach to meeting the Federal goals was a comprehensive, focused approach – the TEAM Initiative**

“It is my intent that the TEAM Initiative ensures that the Department:

- Becomes the first agency to meet all environmental, energy and transportation goals and requirements of EO13423;
- Exceeds the Executive Order goals in several key areas including reduced energy intensity and greenhouse gas emissions, building efficiency, clean energy production and use, and fleet management; and
- Leads all major Federal agencies in overall environmental, energy, and transportation management.”

- Samuel W. Bodman,  
Secretary of Energy



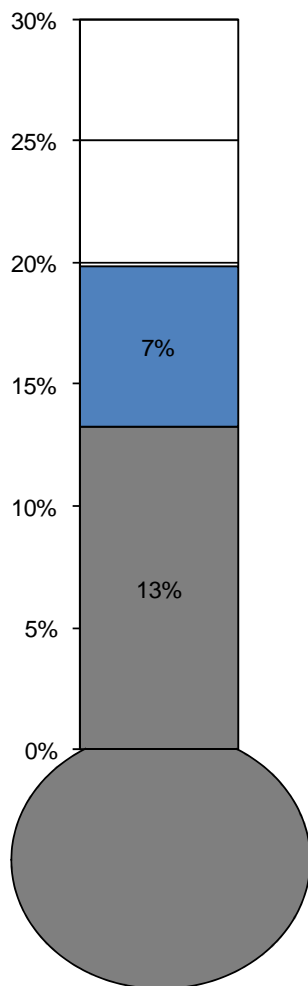
## A record DOE ESPC pipeline

Over 40 comprehensive site evaluations conducted

- Four projects worth \$140M have already been awarded
  - Oak Ridge National Laboratory (\$89M)
  - Idaho National Laboratory (\$33M)
  - Lawrence Livermore National Laboratory (\$11M)
  - National Energy Technology Laboratory (\$6M)
- Over \$250M in project investment is in the works to be awarded
  - 15+ more projects are expected between the end of the year and beginning of next year

Sites with the three major DOE fleets will be outfitted with alternative fueling stations

The \$140M awarded ESPC contracts from TEAM nearly matches that of the **entire** Federal Government in 2007



## TEAM Energy Intensity Reduction Progress

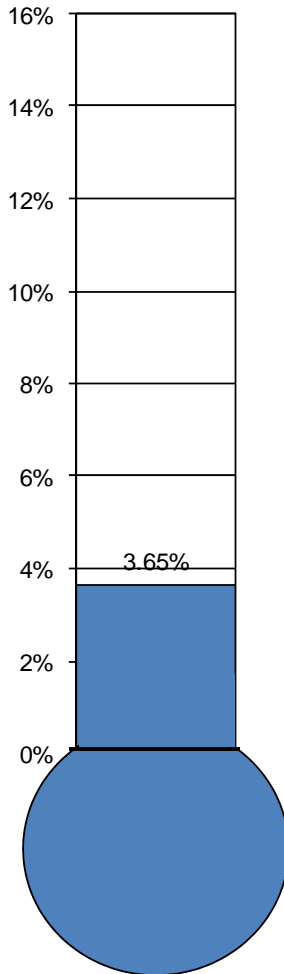
*Goal: 30% energy intensity reduction by 2015 from 2003 baseline*

*TEAM estimates and 2003-2007 energy savings of all sites as of 07/31/08*

In the span of 1 year, TEAM has proposed energy savings that is more than half of what it took 4 years to accomplish

### Major savings measures

Decentralization of steam distribution  
HVAC controls and equipment upgrade  
Lighting and lighting control  
Boiler and chiller upgrades



## TEAM Water Intensity Reduction Progress

Goal: 16% water consumption reduction by 2015, from 2007 baseline

*TEAM Estimates as of 07/31/08*

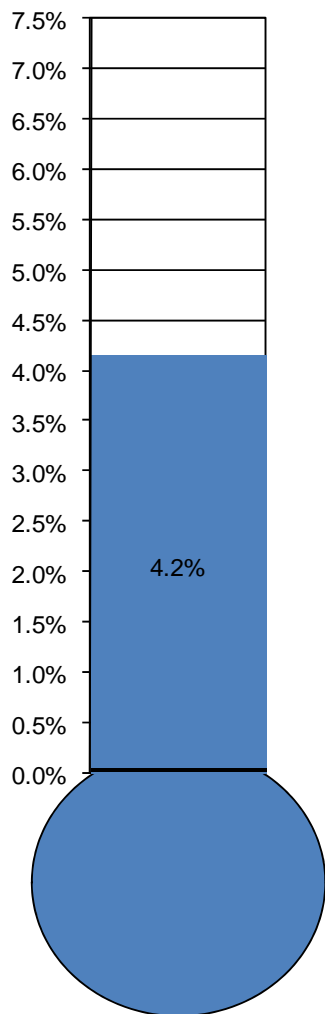
### Major savings measures

Wastewater reclamation

Water saving plumbing fixtures

Redistribution of steam lines and leak repair

Elimination of once-through cooling



## TEAM Renewable Energy Use Progress

Goal: 7.5% on-site renewable energy generation

*TEAM Estimates as of 07/31/08*

Major renewable energy measures  
Biomass fired boilers and cogeneration  
Solar photovoltaic arrays  
Concentrating solar power



## Transportation

- DOE's policy is to provide alternative fuel for every alternative fuel vehicle (AFV)
- The three largest DOE fleets have contracts to build on-site alternative fueling stations
- DOE sites are developing detailed plans to convert their petroleum fleet to AFV and high-efficiency vehicles

## High Performance Sustainable Buildings

- TEAM requires a LEED Gold standard for all new DOE buildings and major renovations
- 15% of existing DOE buildings are being identified and assessed to meet Executive Order 13423 requirements



## **TEAM leveraged existing tools to help commercialize emerging technologies**

- National Energy Technology Laboratory
  - Rooftop wind
  - Hybrid solar lighting
- Oak Ridge National Laboratory
  - Steam generation from biomass
  - Advanced electricity metering
- Idaho National Laboratory
  - Solar transpired heating to pre-heat building air

Many of these projects were not life-cycle cost-effective by themselves, but were bundled with other energy conservation measures to produce a viable contract



## **TEAM is an Agency-Wide Success Strategy**

- DOE Order 430.2b: DOE Policy Driver
- Contractor Requirements
- Public Commitments
- Executive Steering Committee ensures senior management support
- Regular progress reports to Deputy Secretary and Secretary
- Order of Operations: Prioritizes Project Financing
- Executable Plans: Institutionalized Performance Commitments by DOE sites

TEAM was designed to exceed Federal Mandates and position DOE as the Federal leader in energy management



## Franchising TEAM

Comprehensive, agency-wide implementation measures are key to achieving EPA Act, E.O. 13423, EISA goals

- DOE will share policies, procedures and lessons learned with interested Federal agencies.
- State Dept. & other agencies have contacted FEMP for consultation on comprehensive energy evaluation measures.





## For more information about the DOE TEAM Initiative, contact:

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***Questions ?***